IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Kauffman et al.	§	
		§	Group Art Unit: 3672
SERIAL NO.:	10/708,752	§	
		§	EXAMINER: Robert Edward
FILED:	March 23, 2004	§	Fuller
		§	
FOR: Deflection Swivel and Method		§	Confirmation No. 2751
		§	

AMENDMENT AND RESPONSE

TO OFFICE ACTION DATED FEBRUARY 03, 2006

Atty. Docket No.: SPE-23
Date: April 27, 2006

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicant acknowledges receipt of the Office Action dated February 03, 2006 and in response requests that the above-identified application be amended as follows.

Please find enclosed the following sections:

Amendments to the Specification, beginning on page 2.

Amendments to the Claims, beginning on page 5.

Amendments to the Drawings, beginning on page 10.

Remarks, beginning on page 12.

AMENDMENTS TO THE SPECIFICATION

Please amend the specification under 37 C.F.R. § 1.121(b). Applicant appreciates and adopts Examiner's suggestions for correction of typographical errors in paragraphs 9 and 10. Paragraph 10 has been further amended to include the matter from original claim 14. Paragraph 12 has been amended to correct a wrongly numbered reference character. No new matter is added by these amendments.

Please replace paragraph [0009] with the following amended paragraph:

[0009] Referring to Figures 1 and 2 collectively, a deflection sub 10 in accordance with a preferred embodiment of the present invention is shown. Deflection sub 10 assembly preferably includes a tubular retainer sub 20, a swivel mandrel 30, a retainer nut 50, and a bearing 60. Retainer sub 20 preferably includes a rotary threaded drill connection 22 at its distal end to permit connection thereto with additional threaded pipe string components. While threaded connection 22 is shown as a female connection, it should be understood that any connection known in the art may be employed to connect retainer sub 20 to other components. Additionally, retainer sub 20 preferably includes a bore 24 therethrough to allow the flow of drilling

fluids from the fluid system into the drill string. Retainer sub 20 is shown including an enlarged end 26 including threads 28 on an exterior lateral surface and a recess on its interior surface providing a seat 27 for a socket bushing 40.

Please replace paragraph [0010] with the following amended paragraph:

[0010] Socket bushing 40 preferably includes an exterior surface mating with seat 27 and a hemispherical interior surface 43. A passage through socket bushing 40 permits drilling fluid to flow through into the throat of swivel mandrel 30 without obstruction. Socket bushing 40 can be integral to retainer sub 20. Furthermore, socket bushing 40 preferably includes exterior circumferential seals 41 and 42 to prevent the escape of fluids or the ingress of contaminants between the outer surface of socket bushing 40 and retainer sub 20. Seals 41, 42 may be designed to allow rotation of socket bushing 40 with respect to retainer sub 20, if a dynamic-type sealing arrangement is desired. Optionally, the cavity, if any, between seals 41, 42 may be filled with a generally incompressible lubricant to effectuate the integrity of the seals. While seals 41, 42 are shown schematically as o-ring type seals, it should be understood by one of

ordinary skill in the art that any sealing mechanism may be employed, including metal to metal seals.

Please replace paragraph [0012] with the following amended paragraph:

[0012] Following the installation of socket bushing and swivel mandrel into seat 27 of retainer sub 20, a backup ring 44 is installed. Backup ring 44 is preferably designed with a semispherical profile on its leading end and a planar surface on its trailing end. With backup ring 44 securely held in place, ball end 32 of swivel mandrel 30 will be firmly held in place within retainer sub 20. Following installation of backup ring 44, a bearing assembly 60 is installed. Bearing assembly 60 is preferably constructed as a thrust bearing, one whereby axial loads of swivel mandrel 30 and retainer sub 20 are resisted without damaging components of deflection sub assembly 10. Construction of bearing assembly 60 may be of any design known by one skilled in the art but should be capable of resisting the magnitude of the axial loading expected to be experienced by deflection sub assembly 10. Bearing assembly 60 is preferably constructed to allow the rotational movement of swivel mandrel 30 and ball end [[30]] <u>32</u> with respect to retainer sub 20.

AMENDMENTS TO THE CLAIMS

This listing of the claims replaces all earlier versions.

Please amend the claims as follows.

1. (currently amended) An in-line swivel comprising:

a tubular retainer sub;

a swivel mandrel having an enlarged rounded head at its upper end; [[and]]

a retainer nut providing an opening larger than an outer diameter of a lower end of the tubular swivel mandrel, connected to the tubular retainer sub enclosing said rounded head of the tubular swivel mandrel to permit deflection of the swivel mandrel and enclosing a bearing ~~having an upper surface conforming to the rounded head of the tubular swivel mandrel~~ to thereby permit rotational movement of the mandrel ~~upon deflection of the swivel mandrel from the longitudinal axis of the retainer sub~~; and

a backup ring retained between an upper edge of the bearing and a lower hemispherical surface of the swivel mandrel to permit deflection of the swivel mandrel.

2. (currently amended) The ~~drill rig swivel apparatus~~ in-line swivel of claim 1 further comprising a socket bushing inserted in ~~the~~ an interior

surface of the retainer sub providing a profile conforming to the rounded head of the tubular swivel mandrel.

3. (cancelled)

4. (currently amended) The ~~drill rig swivel apparatus~~ in-line swivel of claim 1 wherein the bearing is lubricated by injection of a lubricant from a lower edge of the retainer nut.

5. (currently amended) The ~~drill rig swivel apparatus~~ in-line swivel of claim 1 further including one or more seals on an upper hemispherical surface of the swivel mandrel to prevent egress of drilling fluid around the mandrel into the bearing supporting the mandrel in the retainer sub.

6. (currently amended) The ~~drill rig swivel apparatus~~ in-line swivel of claim [[1]] 2 wherein the socket bushing is ~~further including~~ a hardened insert ~~retained in a lower radial portion of the retainer sub providing a cooperating hemispherical surface conforming to the rounded upper surface shape of the swivel mandrel~~.

7. (currently amended) The ~~hardened insert~~ in-line swivel of claim 6 wherein the hardened insert further ~~comprising~~ comprises seals to prevent drilling fluid from flowing around the insert to reach the bearing.

8. (currently amended) A deflection swivel to allow the deflection of a tubular string attached thereto, the deflection swivel comprising:

a retainer sub~~, said retainer~~ defining a receptacle;

a socket bushing within said receptacle, said socket bushing having a substantially spherical bushing surface;

a swivel mandrel having a spherical distal end~~, said spherical distal end configured to be~~ sealingly received into said spherical bushing surface;

a bearing assembly~~, said bearing assembly~~ configured to resist movement of said spherical distal end away from said socket bushing;

a retainer nut~~, said retainer nut~~ configured to compress said bearing assembly, said spherical distal end, and said socket bushing within said receptacle; and

a backup ring located between said bearing assembly and said spherical distal end, said backup ring having a second spherical bushing surface to engage said spherical distal end opposite said socket bushing.

9. (cancelled)

10. (cancelled)

11. (original) The deflection swivel of claim 8 wherein said bearing assembly includes a thrust bearing.

12. (cancelled)

13. (currently amended) The deflection swivel of claim 8 wherein said retainer nut includes a hydraulic port~~, said hydraulic port~~ configured to communicate with said bearing assembly.

14. (cancelled)

15. (original) The deflection swivel of claim 8 wherein the tubular string is a drill string.

16. (original) The deflection swivel of claim 8 wherein the tubular string is a pipeline string.

17. (original) The deflection swivel of claim 8 wherein said retainer nut limits axial deviation of said swivel mandrel with respect to said retainer sub.

18. (original) The deflection swivel of claim 8 further comprising a plurality of seals between said socket bushing and said receptacle.

19. (original) The deflection swivel of claim 8 wherein said retainer nut is threadably engaged upon said retainer sub.

20. (cancelled)

21. (new) A method for coupling adjacent sections of a tubular string using the in-line swivel of claim 1, the method comprising:

attaching a first end of the in-line swivel to a relatively rigid section of the tubular string;

coupling a relatively displaceable section of the tubular string to a second end of the in-line swivel; and,

articulating the relatively displaceable section with respect to the relatively rigid section with the enlarged rounded head and the backup ring of the in-line swivel.

AMENDMENTS TO THE DRAWINGS

Replacement drawing sheet 2/2 (Figure 2) is submitted herewith. No new matter is included on the replacement drawing sheet. The drawings were objected to for improper hatching and for allegedly not disclosing every feature of the invention specified in the claims. Specifically, the office action alleges the drawings do not illustrate the hardened insert (claim 6), the seals disposed on the hardened insert (claim 7), the two bearing types (claims 11 and 12), backup ring 44 being constructed as part of the bearing assembly (claim 10), and socket bushing 40 being integral to the retainer sub (claim 14).

Proper hatching has been added to interior lip of the retainer nut (elements 52 and 53) in "Replacement Sheet" Fig. 2 as suggested by the Examiner.

The hardened insert of claim 6 refers to element 40, which is also referred to as the "socket bushing". Support for this can be found in paragraph [0006], noting that "hardened insert can be retained in a lower radial portion of the retainer sub providing a cooperating hemispherical surface conforming to the rounded *upper* surface shape of the swivel mandrel." Thus element 40, the hardened insert, is illustrated in Figs. 1-2. Claim 6 is amended to clarify that the socket bushing 40 (claim 2) can be a hardened insert. As recited in claim 7, the hardened insert 40 is illustrated as including seals 33 in both Figs. 1-2.

As recited in claim 11, a thrust bearing, which is defined as "a bearing designed to take thrusts *parallel* to the axis of revolution" on dictionary.com, is shown in Figs. 1-2 as element 60.

Claim 10, reciting the backup ring being constructed as part of the bearing assembly is cancelled. Claim 12 reciting the bearing assembly including a journal bearing is cancelled. Claim 14 reciting the socket bushing being integral to the retainer sub is cancelled. As claims 10, 12, and 14 have been cancelled, the objections to the allegedly absent elements in the drawings should be withdrawn.

REMARKS

Claims 1, 2, 4-8, and 13 are amended, claims 3, 9-10, 12, 14, and 20 are cancelled, and new claim 21 is presented. Claims 1-2, 4-8, 11, 13, 15-19, and 21 are pending in the application.

Claims 2-6 and 7 stand objected to for informalities. Claim 3 has been cancelled. The preambles of dependent claims 2 and 4-6 have been amended, as Examiner has suggested, to read --in-line swivel-- as in independent claim 1 and not "drill rig swivel apparatus." Claim 7 has been amended to correct the preamble to read --in-line swivel-- as in independent claim 1 and not "the hardened insert", and the former preamble "hardened insert" has been moved within the claim to add clarification.

Independent claim 1, and thus dependent claims 2-7, stand rejected under 35 U.S.C. § 112 second paragraph for indefiniteness. Claim 1 has been amended to remove the allegedly indefinite language defining the bearing to have "an upper surface conforming to the rounded head of the tubular swivel mandrel" and to remove the phrase "upon deflection of the swivel mandrel from the longitudinal axis of the retainer sub."

Claims 1, 2, 8, 15, and 17-20 stand rejected as anticipated by *Warren et al*; claims 4, 5, 13, and 16 stand rejected as obvious in view of *Warren et al.* and *Walton*; claim 6 stands rejected as obvious in view of *Warren et al.*

and *Biggs et al.*; and claims 11-12 stand rejected as obvious in view of *Warren et al.* and *Schoeffler et al.* Claims 3, 7, 9, 10, and 14 were indicated as being allowable if rewritten in independent form. Further examination of the application, as amended, and reconsideration of the objections and rejections are respectfully requested.

Amended claim 1 recites the features of original claim 3, now canceled. Support for "backup ring" in amended claim 1 is found inter alia at paragraph [0012]. Claim 6 is amended to clarify that the socket bushing 40 (added into amended claim 1 from original claim 2) can be a hardened insert. Support for this is found inter alia at paragraph [0006], noting that "hardened insert can be retained in a lower radial portion of the retainer sub providing a cooperating hemispherical surface conforming to the rounded *upper* surface shape of the swivel mandrel." As seen more readily in Fig. 2, socket bushing 40 is the cooperating hemispherical surface, and thus can be a hardened insert as recited in amended claim 6. Support for "hardened insert further comprises seals" (claim 7) if found inter alia at paragraph [0006]. Claim 8 is amended to remove superfluous verbiage and to recite the features of original claim 9, now cancelled. Support for "backup ring" in amended claim 9 is found inter alia at paragraph [0012]. Claim 13 is amended to remove superfluous verbiage.

New claim 21 recites the method of claim 20, now cancelled, as applied to the apparatus of claim 1. Support for this is found inter alia at paragraph [0001]. No new matter is presented.

Figures 1-2 were objected to under 37 CFR 1.83(a) for not including every feature specified in the claims. Applicant submits that in light of the amendments to the claims, every feature is now illustrated in the drawings. Please see the section titled AMENDMENTS TO THE DRAWINGS above for further discussion. Figure 2 was further objected to for omitted hatching. Replacement sheet Fig. 2 with corrected hatching is attached.

The declaration was found defective under 37 C.F.R. § 1.66 or 1.68. By mistake, and with no deceptive intent, a blank declaration (D.P.O.A.) was previously filed. Applicant has electronically filed on April 13, 2006 a supplemental Application Data Sheet (A.D.S.) with an unchanged copy of the original declaration (D.P.O.A.). Please find a copy of the electronic acknowledgement receipt attached.

By way of background, Applicant's invention provides a method and apparatus to permit axial deflection and rotation of a tubular string with an in-line deflection swivel. See paragraph [0002]. A backup ring can be located between an upper edge of the bearing and a lower hemispherical surface of the swivel mandrel. Bearing assembly is preferably constructed

to allow the rotational movement of swivel mandrel and ball end with respect to retainer sub. See last sentence of paragraph [0012]. The bearing assembly can support the backup ring, which in turn can support the swivel mandrel and loads attached thereto. See paragraphs [0011]-[0012].

Warren et al. teaches a curved drilling apparatus that includes an improved flexible joint 286, which the office action alleges is a swivel. Regarding amended claim 1, *Warren et al.* does not teach or suggest a *swivel* as in Applicant's claims, but in sharp contrast teaches a flexible joint which transmits torque to a drill bit. Applicant notes at paragraph [0012], "bearing assembly is preferably constructed to allow the *rotational* movement of swivel mandrel and ball end with *respect to* retainer sub." Any rotation imparted to the mandrel of Applicant's claimed deflection swivel will not be imparted to the tubular retainer sub itself. At column 12/lines 9-12 *Warren et al.* states the flexible joint "*must* be capable of transmitting: axial thrust towards the drill bit, tensile force for pulling if the bit becomes stuck, and *torque* to rotate the drill bit." *Warren et al.* teaches away from use as a swivel as it discloses particular structure to transmit torque through the joint. The joint taught is not a swivel that allows rotation with respect to each end and does not transmit torque.

Further, the office action alleges element 260 of *Warren et al.* are bearings. Elements 260 of *Warren et al.* are *torque* transmitting balls (see 14/42) that do not "permit rotational movement of the mandrel" as does the bearing 60 in Applicant's claim 1, but only permits deflection. At 14/17-23 *Warren et al.* states "one especially novel feature of the improved flexible joint 286 illustrated in FIGS. 5 and 5C is the method by which *torque* is transmitted across the joint. Referring to FIG. 5E, six metal balls 260 are located in generally complementary spherical pockets or cavities 270 and 272 in the ball pin 262 and in the thrust bushing 274 for smoothly transmitting the torque."

Nor would it have been obvious to use the improved flexible joint 286 of *Warren et al.* as a swivel, as the metal balls 260 transmit torque. The relative rotation relative of one end of the joint without rotation of the opposing end (e.g. use as a swivel) would accordingly deny torque from being imparted across the improved flexible joint, and to the attached bit, and thus change the principle of operation as the curved drilling apparatus is taught to requires the transmittal of torque.

In addition to the argument that no bearing and/or swivel is taught or suggested, *Warren et al.*, does not teach or suggest a backup ring. Amended claim 1 recites the limitation of a "backup ring retained between an upper

edge of the bearing and a lower hemispherical surface of the swivel mandrel to permit deflection of the swivel mandrel." *Warren et al.* does not disclose a backup ring retained between a bearing and the swivel mandrel. Even assuming element 260 is a bearing, which Applicant strongly denies, there is no backup ring retained between the "bearing" 260 and swivel mandrel. Further, it would not have been obvious to include a backup ring between the "bearing" and swivel mandrel. *Warren et al.* at 14/23-33 notes:

> six metal balls 260 are located in generally complementary spherical pockets or cavities 270 and 272 in the ball pin 262 and in the thrust bushing 274 for smoothly transmitting the torque. These cavities or pockets 270 and 272 are shaped so that, when the joint is deflected in any direction (within its design limits), all of the balls are equally loaded. In particular, the pockets 270 in the ball pin 262 are substantially spherical to keep the balls 260 in place relative to the center of the "ball" at the end of the ball pin; however, the adjacent pockets 272 are not perfectly spherically complementary in shape (i.e., oval in shape) so as to allow limited relative angular movement (e.g., about a few degrees) of the socket housing 252 relative the loading housing 250.

There is no reasonable expectation of success in inserting a backup ring. Any attempt to insert a backup ring into the cavities (e.g. 270) between the balls 260 and the ball pin 262 can affect the geometry and/or fit of the balls 260 and respective pockets (270, 272). The resulting combination can thus deny the above quoted teachings of *Warren et al.* that "all of the balls are

equally loaded" and the allowance of "limited relative angular movement" due to the presence of a backup ring.

Warren et al. does not anticipate amended claim 8 as it does not teach or suggest a deflection *swivel* or a backup ring, for the same reasons recited above in reference to amended claim 1. Element 260 is a metal ball and cannot be said to be a bearing as alleged in the office action, as discussed above.

Element 278 is also alleged to be a bearing assembly, however element 278 is referred to as a bearing member and a spacing member. See 16/36-44 and Fig. 7. If element 278 is considered a backup ring, which Applicant strongly denies, there is no bearing assembly. Neither element 260 or 278 can said to be a bearing assembly as in Applicant's claim 8. Nor would it have been obvious to include a bearing assembly below element 278 as the improved flexible joint 286 allows deflection but teaches squarely away from allowing *rotation* across the sub. See 14/17-23.

As to claim 17, *Warren et al.* teaches (for example, Fig. 5C) the retainer nut (item 290) does not limit axial deflection as spacing member 278 would contact shaft 263 and limit axial deflection, and not retainer nut 290 as the office action alleges.

However, neither element (278, 290) limits axial deflection. *Warren et al.* at 14/23-29 teaches that "the adjacent pockets 272 are not perfectly spherically complementary in shape (i.e., oval in shape) so as to *allow limited relative angular movement* (e.g., about a few degrees) of the socket housing 252 relative the loading housing 250." Consequentially, axial deflection is limited by the interaction of a steel ball housed between a circular and an *ovate* pocket (270, 272), and not contact between spacing member 278 and shaft 263.

As to new method claim 21, *Warren et al.* does not teach or suggest the swivel with a backup ring and a bearing of claim 1, and thus a method of coupling adjacent sections of a tubular string using the in-line swivel of claim 1 is similarly not taught or suggested.

In view of the above, it is respectfully submitted that *Warren et al.* fails to show or suggest the present invention as recited in amended claims 1, 8, 21, and the claims depending therefrom. Accordingly, withdrawal of the rejection in view of *Warren et al.* is respectfully requested.

Nor would Applicant's invention of claims 4, 5, 13, and 16 have been obvious in light of *Warren et al.* and *Walton*. *Walton* teaches a ball and socket joint for pipelines where "grease is supplied between the spherical surfaces on the socket and the ball through grease fitting 20 and passageway

21" (2/23-25). In sharp contrast to this, claim 4 recites "where the *bearing* is lubricated by injection of a lubricant from a lower edge of the retainer nut." Neither *Warren et al.* nor *Walton* teaches a *bearing* that is lubricated, but in sharp contrast teach lubricating a ball and socket joint.

The ball and socket joint cannot be said to be a bearing as in claim 4. Claim 4 includes the limitation of claim 1 of a backup ring retained between a bearing and the swivel mandrel. Paragraph [0012] notes "bearing assembly 60 is preferably constructed as a thrust bearing, one whereby axial loads of swivel mandrel 30 and retainer sub 20 are resisted without damaging components of deflection sub assembly 10." The backup ring 44 supports the swivel mandrel 30 when an axial load is applied, with the bearing 60 supporting the swivel mandrel 30 and thus permitting rotation. See paragraphs [0004] and [0005]. The combination of *Warren et al.* and *Walton* does not teach or suggest a backup ring, let alone a backup ring retained *between* a bearing lubricated by injection and the hemispherical surface of a swivel mandrel.

At 3/37-43 *Walton* teaches a ball member 52 supported by balls 55 engaging spherical surface 54 and a means 62 for lubrication. However, all of the claim limitations are not met as claims 4 and 5 include the elements of claim 1. Claim 1 recites a backup ring *between* a bearing and the

hemispherical surface of a swivel mandrel. Backup ring itself, and not the bearing, for example, is in contact with the enlarged rounded head of the swivel mandrel, whereas the balls themselves (assuming for arguendo to be bearings) are in direct contact with the enlarged rounded head in *Walton*. Any axial load experienced by an invention under Walton would be "supported by a plurality of balls 55" (3/38). In sharp contrast, any axial load on an invention under Applicant's claim 1 would be supported by a backup ring, as it is retained between the bearing and the swivel mandrel. A plurality of balls cannot be said to be the equivalent to a backup ring *and* a bearing (e.g. a thrust bearing) as in Applicant's claims. Applicant's invention includes a bearing, for example, that allows rotation, however the backup ring itself is in contact with the enlarged rounded head. No where does *Walton* teach or suggest a backup ring and/or bearing as in Applicant's claims, and thus *Walton* cannot be said to teach or suggest such a bearing being lubricated by injection.

Similarly, all of the claim limitations are not met in claims 13 and 16, which include the elements of claim 8. As noted above, neither *Warren et al.* nor *Walton* teaches or discloses a backup ring, let alone a backup ring that is "located between said bearing assembly and said spherical distal end, said backup ring having a second spherical bushing surface to engage said

spherical distal end opposite said socket bushing" (see claim 8). Neither a bearing assembly nor a cooperating backup ring is disclosed by either reference. Any attempt to relate the different structure (e.g. balls contacting and supporting the enlarged rounded head) claimed in *Walton* to find Applicant's invention obvious would be impermissible hindsight. *Walton* fails to bridge the gap from *Warren et al.* to Applicant's invention as all of the elements are not taught or suggested.

Claim 6 stands rejected as obvious under *Warren et al.* in view of *Biggs et al.* *Biggs et al.* teaches a knob 27 that is retained with suitable friction reducers 29. At 3/21-24 noting that typical friction reducers may comprise silicones, silicon rubbers, greases, or even lubricant impregnated solids such as brass or the like." A friction reducer cannot be said to be a hardened insert as in claim 6. Silicon, rubber, and grease would not have been considered hardened materials to one of ordinary skill in the art. Brass is typically referred to as a "soft" metal, and thus would not be considered to be a hardened insert. *Biggs et al.* does not teach or disclose a hardened insert, but in sharp contrast teaches use of a "soft" insert such as silicone and brass impregnated with a lubricant. *Warren et al.* does not teach a hardened insert, but teaches "dissimilar metals" (14/13).

Claims 11 and 12 stand rejected as obvious under *Warren et al.* in view of *Schoeffler et al.* *Schoeffler et al.* teaches a directional drilling tool with an angularly displaceable thrust bearing assembly 24 that includes a ball 32 and first and second thrust bearings (26, 28). Claims 11 and 12 depend from claim 8, which includes the limitation that "a backup ring located between said bearing assembly and said spherical distal end, said backup ring having a second spherical bushing surface to engage said spherical distal end opposite said socket bushing."

Each and every element of claims 11 and 12 are not taught by *Warren et al.* in view of *Schoeffler et al.* Neither reference discloses a deflection swivel. Both references disclose a deflection joint used to transmit torque across the joint to enable drilling. As above, *Warren et al.* does not disclose a bearing as in Applicant's claims.

Schoeffler et al. does not teach or suggest a deflection *swivel*, but in sharp contrast teaches a thrust bearing supporting a drive tube. Any torque imparted to the upper portion of the tube retained by thrust bearing assembly will be imparted to the lower portion of the tube as the tube is continuous.

Nor would it have been obvious how the invention of *Schoeffler et al.*, alone or in combination with *Warren et al.,* would have been configured to function as a swivel. *Schoeffler et al.* teaches squarely away from use as a

swivel as the joint is used to support a drive tube that *rotates* an attached drill bit. See 4/60 to 5/6 and 6/38-48. The proposed modification of somehow creating a deflection *swivel* out of the angularly displaceable thrust bearing assembly 24, which the office action does not recite, would destroy the principle of operation of the *Schoeffler et al.* invention as *no* torque would be transmitted to the drill bit and thus *no* drilling could occur.

Applicant's independent claim 8, and thus dependent claim 11, also recites the limitation of a backup ring with a spherical bushing surface to engage the spherical distal end, with said backup ring (which engages the spherical distal end of the swivel mandrel) located *between* the bearing assembly and the spherical distal end of the swivel mandrel. The thrust bearing disclosed in *Schoeffler et al.* is disposed *between* the supported drive tube 20 and ball 32, which is retained by curved support collars (36, 38). This cannot be said to be an equivalent limitation to that which is claimed. The bearings of *Schoeffler et al.* are disposed *within* ball 32, which can create complex assembly and/or lubrication issues as compared to Applicant's claimed invention.

Additionally, *Schoeffler et al.* teaches away from use as a swivel. The structure taught by *Schoeffler et al.* requires deflection of an *entire* drive tube 20 that extends through the pivot point 33, whereas Applicant's claim

11 is to a deflection swivel "to allow the deflection of a tubular string attached thereto". Attaching a tubular string to the drive tube 20 of *Schoeffler et al.* would not allow deflection of the tubular string relative to the sub, thus *Schoeffler et al.* does not teach or suggest a solution. There is no recognition of the problem that "angular and rotational deflections are an issue" in regards to an attached drill string or other pipe (paragraph [0001]), but in sharp contrast the invention *imparts* angular deflection to the attached tube. At 8/57-64 stating "compliant ball 32 rotating in response to the *deflection* of tube 20 changes the angle of drill bit 30 with respect to the center axis of outer casing cylinder 48 by a deflection amount established by the downward travel of cam driving member 86 upon the activation of spline clutch member 52 by mud pressure. This activation provides a known fixed and constant offset angular *deflection* for drill bit 30." It would not have been obvious to combine the drilling apparatuses of *Warren et al.* and *Schoeffler et al.* to obtain Applicant's invention.

The purported combination of the above references thus would not have made obvious the Applicant's invention. Dependent claims are allowable for at least the same reasons. Examiner's rejections and objections are believed to be fully traversed. In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. If

any issues remain that are appropriate for resolution by telephone interview, please contact undersigned counsel.

Respectfully submitted,

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Attachments: Replacement Drawing

Electronic Acknowledgement Receipt (2 pages)